ENCYCLOPEDIA
on Early Childhood
Development

Socioeconomic Status and the Development of Executive Function

Cayce J. Hook, BA, Gwendolyn M. Lawson, BA, Martha J. Farah, PhD

University of Pennsylvania, USA

January 2013

Introduction

Emerging research points to a relationship between childhood socioeconomic status and executive function performance. As both socioeconomic status and executive function are strongly and independently correlated with academic and health outcomes, an understanding of their interrelationship may have the potential to inform interventions designed to reduce disparities and promote healthy development for all children.

Subject

Socioeconomic status, a measure of social standing that typically includes income, education and occupation, has been linked to a wide array of life outcomes, ranging from cognitive ability and academic achievement to physical and mental health.[1-5] Understanding the pathways by which childhood socioeconomic status influences life outcomes is a question of critical importance to education and public health, particularly as global economic trends force more families into poverty.[6]

©2013-2026 ABILIO | EXECUTIVE FUNCTIONS

Current knowledge of socioeconomic status and child development indicates that children from higher-socioeconomic status families display better executive function – the ability to actively direct, control and regulate thoughts and behaviour – than children from low-socioeconomic status families. As executive function has been shown to predict school achievement[7,8] and is also associated with mental health outcomes,[9-13] it is possible that it may partially mediate the well-established link between socioeconomic status and academic achievement.

Problems

Research on this topic faces certain methodological challenges, resulting in part from the broad and sometimes ambiguous nature of the terms “executive function” and “socioeconomic status.” “Executive function” refers to the higher-order processes such as inhibitory control, working memory, and attentional flexibility that govern goal-directed behaviour. This wide range of abilities can be operationalized by many different valid tasks, such as computerized cognitive tasks or parental reports of children’s behaviour.[14] Likewise, “socioeconomic status” is a broad construct that may be measured in various ways.[15] Furthermore, it cannot be experimentally manipulated, making it difficult to disentangle genetic and environmental effects, as well as the individual contributions of the various conditions of poverty (e.g., increased family stress, reduced cognitive stimulation, worse nutrition, crowding and poor environmental conditions).[16,17] The difficulty of establishing causality in the relationship between socioeconomic status and executive function points to the need for large, well-designed, cautiously interpreted studies.

Research Context

Most studies of socioeconomic status and executive function have examined behavioural performance on developmentally appropriate executive function tasks, although a few recent studies[18-20] have, instead, used electrophysiological measure *prefrontal cortical* function. Executive function development has been investigated using both cross-sectional studies and large-scale longitudinal studies, such as the NICHD (National Institute of Child Health and Human Development) Study of Early Childcare and the Family Life Project. Many mediation studies use home-visit measures, such as the HOME inventory[21] or observations of parent-child interactions during free or structured play.[22]

Key Research Questions

1. What is the relationship between childhood socioeconomic status and executive function development?

2. What environmental factors mediate the relationship between socioeconomic status and executive function?

Recent Research Results

What is the relationship between socioeconomic status and executive function performance?

Research indicates that socioeconomic status influences neurocognitive systems unevenly. In a recent set of studies,[23-25] kindergarteners, first graders, and middle schoolers of varying socioeconomic status took batteries of tasks assessing independent cognitive systems, including executive function, memory, language, and visuospatial cognition. Language abilities and executive function – particularly the domains of working memory and cognitive control – were among the most strongly affected.

Socioeconomic status disparities in executive function have been documented across a large age range, from infancy[26] through late childhood.[27] Studies have consistently found that higher socioeconomic status is associated with better executive function performance across different measures of socioeconomic status (such as family income-to-needs ratio or maternal education) and across different measures of executive function (such as working memory and inhibitory control).[28-32]

Executive function is supported by a region of the brain called the prefrontal cortex, which undergoes a long period of post-natal development,[33] and thus may be particularly susceptible to influences of childhood experience. Researchers have used event-related potentials (ERPs), which measure brain activity via electrodes placed on the scalp, to examine socioeconomic differences in neural processing in the prefrontal cortex. Two ERP studies[18,20] compared neural measures of selective attention across socioeconomic groups. In both cases, there were no differences on task performance, but neural processing evidence indicated that children from low-socioeconomic status attended more to irrelevant stimuli than did their high-socioeconomic status counterparts.

What factors mediate the relationship between socioeconomic status and executive functions?

Many environmental factors – such as stress, cognitive stimulation in the home, prenatal environment and nutrition – have been shown to vary along socioeconomic lines.[16,17] Any of these factors could contribute to socioeconomic disparities in executive function. Recent research has attempted to isolate environmental factors that mediate the socioeconomic status-executive function relationship. These mediating factors may inform interventions targeting socioeconomic status disparities in executive function and other cognitive and behavioural outcomes.

Several studies have found evidence that different aspects of the early family environment influence the development of executive function. For example, the quality of parent-child interactions, particularly during infancy, has been found to mediate socioeconomic status effects on executive function at 36 months of age.[22] Additionally, infants' stress levels (measured by salivary *cortisol*) partially explained the effect of positive parenting on executive function, suggesting that parenting may affect it by shaping children's stress responses.[28] Other studies indicate that parent support of child autonomy,[34] parent scaffolding by non-intrusive help and guidance and family chaos[35,36] are important predictors of early childhood executive function.

Research Gaps

- The trajectory of executive function disparities is largely unknown. Socioeconomic status effects could grow over time, for example if they compound throughout development. Conversely, they could remain constant, or they could diminish, for example if counteracted by formal education.
- Research to date suggests that executive function development may be particularly susceptible to environmental influences in the years between infancy and preschool, but the exact timing and nature of this possible sensitive period awaits further research.
- It is difficult to disentangle the role that genetic and environmental factors play in the development of executive function, and the causal nature of the relationship between socioeconomic status and executive function has not yet been fully established. One way to establish causality in this relationship is to study outcomes of interventions that change factors of the childhood environment.
- While executive function differences are hypothesized to at least partly account for disparities in academic achievement, the extent to which interventions improving executive function will lead to improvements in other life outcomes merits further investigation.

Conclusions

Evidence points to a clear association between childhood socioeconomic status and executive function performance. This association appears to be mediated by aspects of the family environment, particularly factors involving the quality of the parent-child relationship and its ability to buffer stress. Research in this area is in its early stages, and studies currently underway will further our understanding of the nature of the socioeconomic status-executive function relationship and the environmental factors that contribute to it.

It is important to note that the existence of socioeconomic status-related differences in executive function and brain function does not in any way imply that these differences are innate or unchangeable. The brain is a highly plastic organ; in fact, an emerging body of research demonstrates that the neural correlates of cognition can be changed by environmental experience.[37] We hope that elucidating socioeconomic status effects on cognitive development will allow interventions to target more specific cognitive processes and environmental factors, ultimately helping to reduce socioeconomic disparities.

Implications

Social policies designed to reduce socioeconomic status disparities have traditionally targeted either socioeconomic status itself or broad achievement outcomes. Research discussed in this article reveals additional targets: factors that mediate the relationship between socioeconomic status and executive function (e.g., the home environment), and executive function itself.

An emerging body of research[38] indicates that interventions can improve executive function in children. Successful interventions include training software, games, yoga and meditation, sports participation and specialized classroom curricula; lower-income children are among those who show the largest improvements.

In what ways can policies and services address the root causes of the socioeconomic status-executive function gap? Because the home environment has lasting effects on development, policies that address children's broader environments – rather than those that focus solely on school and child care settings – may be helpful. In particular, mediation studies point to the need for programs and interventions that reduce parental stress and increase children's access to cognitively stimulating activities and resources.[39]

References

1. Adler NE, Boyce T, Chesney MA, Cohen S, Folkman S, Kahn RL, & Syme SL. Socioeconomic status and health: The challenge of the gradient. *American Psychologist*. 1994;49(1):15-24.
2. Gottfried AW, Gottfried AE, Bathurst K, Guerin DW, & Parramore MM. In: Bornstein, MH, Bradley RH, eds. *Socioeconomic Status, Parenting, and Child Development. Monographs in Parenting Series*. Mahwah, NJ, US: Lawrence Erlbaum Associates; 2003; 189-207.
3. Merikangas KR, He JP, Brody D, Fisher PW, Bourdon K, Koretz DS. Prevalence and treatment of mental disorders among US children in the 2001–2004 NHANES. *Pediatrics*. 2010; 125(1):75-81.
4. Shanahan L, Copeland W, Costello EJ, & Angold A. Specificity of putative psychosocial risk factors for psychiatric disorders in children and adolescents. *Journal of Child Psychology and Psychiatry*. 2008;49(1):34-42.
5. Sirin SR. Socioeconomic status and academic achievement: a meta-analytic review of research. *Review of Educational Research*. 2005;75(3):417-453.
6. Fritzell J, Ritakallio V. Societal shifts and changed patterns of poverty. *International Journal of Social Welfare*. 2010;19:S25-S41.
7. Blair C, Diamond A. Biological processes in prevention and intervention: the promotion of self-regulation as a means of preventing school failure. *Development and Psychopathology*. 2008; 20:899-911.
8. Evans GW, Rosenbaum J. Self-regulation and the income-achievement gap. *Early Child Research Quarterly*. 2008; 23(4):504-514.
9. Barch D. The cognitive neuroscience of schizophrenia. *Annual Review of Clinical Psychology*. 2005; 1:321-353.
10. Bush G, Valera EM, & Seidman LJ. Functional neuroimaging of Attention-Deficit/Hyperactivity Disorder: A review and suggested future directions. *Biological Psychiatry*. 2005; 57:1273-128.
11. Morgan AB, Lilienfeld SO. A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review*. 2000; 20(1):113–136.
12. Rogers RD, Kasai K, Koji M, Fukuda R, Iwanami A, Nakagome K., et al. Executive and prefrontal dysfunction in unipolar depression: a review of neuropsychological and imaging evidence. *Neuroscience Research*. 2004; 50(1):1-11.
13. Williams JM, Watts, FM, Macleod C, & Mathews A. *Cognitive Psychology and Emotional Disorders* (2nd ed.). New York: John Wiley and Sons; 1997.
14. Miyake A, Friedman NP, Emerson MJ, Witzki AH, Howerter A, Wager T. The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: a latent variable analysis. *Cognitive Psychology*. 2000; 41(1):49-100.
15. Hauser RM. Measuring socioeconomic status in studies of child development. Child Development. 1994; 65:1541-1545.
16. Bradley RH, Corwyn RF. Socioeconomic status and child development. *Annual Review of Psychology*. 2002; 53(1):371-399.
17. Evans GW. The environment of childhood poverty. *American Psychologist*. 2004; 59(2):77-92.
18. D'AngiulliA, Weinberg J, Grunau R, Hertzman C, and Grebenkov P. Towards a cognitive science of social inequality: Children's attention-related ERPs and salivary cortisol vary with their socioeconomic status. Proceedings of the 30th Cognitive Science Society Annual Meeting. 211-216
19. Kishiyama, MM, Boyce WT, Jimenez AM, Perry LM, Knight RT. Socioeconomic disparities affect prefrontal function in children. *Journal of Cognitive Neuroscience*. 2008; 21(6):1106-1115.
20. Stevens C, Lauinger B, Neville H. Differences in the neural mechanisms of selective attention in children from different socioeconomic backgrounds: an event-related brain potential study. *Developmental Science*. 2009; 12(4):634-646.

©2013-2026 ABILIO | EXECUTIVE FUNCTIONS

21. Bradley RH, Corwyn RF, McAdoo HP, Coll CG. The home environments of children in the United States. Part 1: variations by age, ethnicity, and poverty status. *Child Development*. 2001; 72(6):1868-1886.

22. Rhoades BL, Greenberg MT, Lanza ST, Blair C. Demographic and familial predictors of early executive function development: contribution of a person-centered perspective. *Journal of Experimental Child Psychology*. 2011; 108(3): 638-662.

23. Farah MJ, Shera DM, Savage JH, et al. Childhood poverty: Specific associations with neurocognitive development. *Brain Research*. 2006; 1110(1): 166-174.

24. Noble KG, Norman MF, Farah MJ. Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science*. 2005; 8(1): 74-87.

25. Noble KG, McCandliss BD, Farah MJ. Socioeconomic gradients predict individual differences in neurocognitive abilities. *Developmental Science*. 2007; 10(4): 464-480.

26. Lipina SJ, Martelli MI, Vuelta B, Colombo JA. Performance on the A-not-B task of Argentinian infants from unsatisfied and satisfied basic needs homes. *International Journal of Psychology*. 2005; 39: 49-60.

27. Sarsour K, Sheridan M, Jutte D, Nuru-Jeter A, Hinsh S, Boyce WT. Family socioeconomic status and child executive functions: The roles of language, home environment, and single parenthood. *Journal of the International Neuropsychological Society*. 2011; 17(1): 120-132.

28. Blair C, Granger DA, Willoughby M et al. Salivary cortisol mediates effects of poverty and parenting on executive functions in early childhood. *Child Development*. 2011; 82(6): 1970-1984.

29. Hughes C, Ensor R. Executive function and theory of mind in 2 year olds: a family affair? *Developmental Neuropsychology* . 2005; 28(2): 645-668.

30. Lipina SJ, Martelli MI, Vuelta BL, Injoque-Ricle I, Colombo JA. Poverty and executive performance in preschool pupils from Buenos Aires city (Republica Argentina). *Interdisciplinaria*. 2004; 21(2): 153-193.

31. Mezzacappa E. Alerting, orienting, and executive attention: Developmental properties and sociodemographic correlates in an epidemiological sample of young, urban children. *Child Development*. 2004; 75(5): 1373-1386.

32. Wiebe SA, Sheffield T, Nelson JM, Clark CAC, Chevalier N, & Espy KA. The structure of executive function in 3-year-olds. *Journal of Experimental Child Psychology*. 2011; 108(3): 436-452.

33. Casey BJ, Giedd JN, Thomas KM. Structural and functional brain development and its relation to cognitive development. *Biological Psychology*. 2000; 54(1-3): 241-257.

34. Bernier A, Carlson SM, Whipple N. From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development*. 2010; 81(1): 326-339.

35. Bibok MB, Carpendale JIM, Muller U. Parent scaffolding and the development of executive function. *New Directions in Child and Adolescent Development*. 2009; 123: 17-34.

36. Hughes C, Ensor R. How do families help or hinder the emergence of early executive function? *New Directions in Child and Adolescent Development*. 2009; 123: 35-50.

37. Rosenzweig, MR. Effects of differential experience on the brain and behavior. *Developmental Neuropsychology*. 2003;24(2-3):523-540.

38. Diamond A, Lee K. Interventions shown to aid executive function development in children 4 to 12 years old. *Science*. 2011;333(6045):959 -964.

39. Hackman DA, Farah MJ, Meaney MJ. Socioeconomic status and the brain: mechanistic insights from human and animal research. *Nature Reviews Neuroscience*. 2010; 11: 651-659.